PONCA CITY, OKLAHOMA
Air Toxics Assessment

Final Report
April 30, 2004

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NOTES ABOUT THIS REPORT: This report was written as a web document, not as a traditional printed and bound hard-copy. The size and complexity of the data sets require that they be referenced and/or linked rather than included in the text. Also, the air monitoring conducted in Ponca City is referenced in this report, but the specific data is not analyzed nor included in the report. The monitoring is on a different schedule and has different reporting requirements, so it will be available at a later date on the Air Quality part of the DEQ web page. Included in the appendix are the comments received on the draft report from the six major sources included in the report. As a courtesy these sources were allowed to review the draft before its release, and their comments are included in the appendix. Unless noted, no changes were made to the report itself based on those comments.

PROJECT OVERVIEW

In September 2002 the Air Quality Division (AQD) of the Oklahoma Department of Environmental Quality (DEQ) began an assessment of the air toxic risk in Ponca City, Oklahoma. The project was a partnership with the Region 6 (Dallas) office of the U.S. Environmental Protection Agency (EPA), and the AQD portion was funded by an EPA grant.

As designed, the project had two complementary goals: to examine the accuracy of the National Air Toxics Assessment (NATA), which had indicated unusually high risk in Kay County, and to build the DEQ's capacity to conduct air toxic activities through a partnership and pilot project with EPA.

The mechanism chosen for the Ponca City assessment was the Regional Air Impact Modeling Initiative (RAIMI) process developed by Region 6. Essentially, the RAIMI process combines established air emission modeling and risk modeling in a Geographic Information System (GIS) environment. This computerized approach is essential for handling the very large data sets from emission inventories and emission modeling. Complete information on the RAIMI[i] process is available from Region 6, EPA.

PROJECT TIMELINE AND STEPS

The Ponca City assessment followed a series of steps designed to set the limits of the study, implement the study, and present the results. Many of these "steps" were integrated, and were concurrent with other portions of the study itself. After the initial conceptualizing steps in April 2002, the study followed this progression:

Study Area selection (August 2002):   After an initial survey of sources and population, DEQ selected a 20-kilometer by 20-kilometer square area centered on the city of Ponca City.   This area to included all the major sources of air pollution in the immediate area. See the embedded map of the area:

Map of PC Assesment area.pdf

Pollutants selected (August 2002): Based on a review of the NATA modeling and the emission inventories from the sources in the area, and considering available resources, DEQ chose to concentrate on the volatile organic compounds (VOCs) emitted in the area, and not semi-volatiles, particulates, and metals. Similar factors resulted in the choices to model only inhalation risk and to exclude mobile and area sources from the study.

Communication (July 2002-April 2004):   DEQ and Region 6 maintained communication channels through monthly conference calls, but also realized that the affected industries and citizens should be kept informed and have appropriate

involvement. One of the first actions (July 31, 2002) in the study was a meeting with all the industries listed in the AQD Emission Inventory in the study area, both major and area sources.   This was an informational meeting with DEQ and Region 6 providing project outlines and contacts and requesting cooperation.

To inform and involve the citizens, DEQ held meetings with the ConocoPhillips Community Advisory Council on October 10, 2002 (pre-study), and on February 12, 2004 to present the results. Both meetings were well-attended and provided very good input to the study, especially the results meeting.

Emission Inventory Review and Enhancement (September 2002-October 2003): Oklahoma has a well-established annual emission inventory program, but early in the study it became apparent that the local air toxics emission inventory data would need to be reviewed and expanded for the modeling to be meaningful.   A questionnaire developed by Region 6 to expand and explain the data was supplied to each of the six major facilities involved in the study. These included questions about the orientation of area sources and other information not routinely submitted. Some emissions inventory source information was corrected through geo-correction of the location of the sources by using aerial photographic overlays; on some sources that appeared mislabeled, DEQ re-visited the sources and used a GPS locator to allocate new map coordinates.

VOC speciation (January 2002-October 2003): One of the earliest and largest problems encountered in the Ponca City study was the issue of unspeciated VOCs in the emission inventories. The inventory reporting requirements did not require specific information and speciation of VOCs, and despite DEQ requests for speciated VOC information from local industries, over 2,000 tons of unspeciated VOC were reported (see chart below)
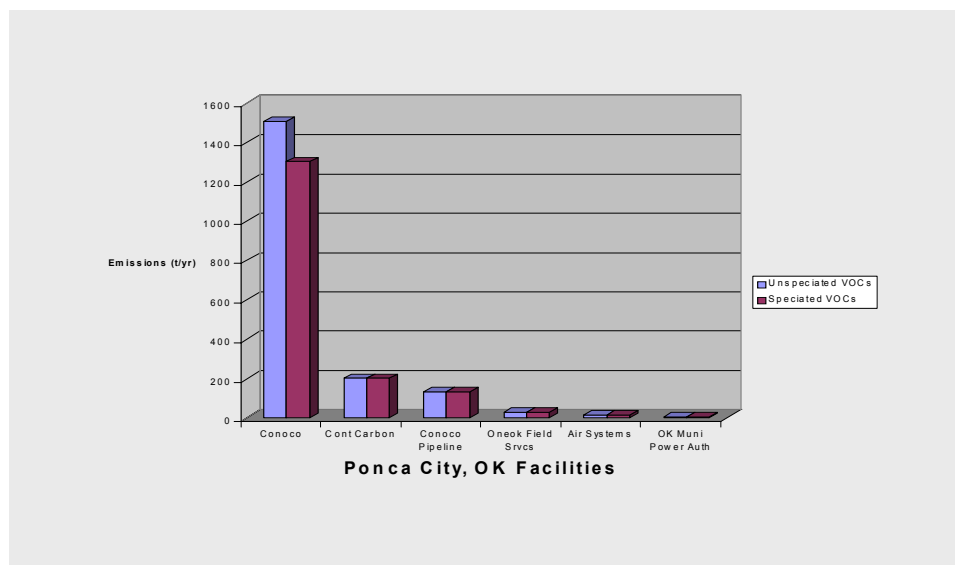
This common practice in emission inventory reporting caused problems in the modeling, because toxicity values cannot be assigned to generic VOC emissions. To help provide a more complete and conservative estimation of the specific types and amounts of

speciated VOCs that may actually be emitted in the project area, DEQ requested EPA Region 6 derive estimated speciated VOC emission constituents and corresponding emission rates for the remaining non-speciated VOCs. The emission characterization process described below was used to accomplish this.

Emissions characterization: Emissions characterization is the process of identifying emissions sources, types and amounts. For the Ponca City Air Toxics Project, the DEQ state database was queried for facilities within Kay County and surrounding counties emitting more than 0.1 tons (200 lbs) of a volatile organic compound (VOC). The majority of the total VOC emissions were attributed to three industrial facilities within the project assessment area. These three industrial facilities had the following number of reported emission sources and non-speciated total VOCs:

- Conoco Refinery (54 sources representing 1535 tons)
- Conoco Tank farm (159 sources, 492 tons)
- Continental Carbon (15 sources, 200 tons)

Additional VOC emissions speciation was pursued to facilitate air modeling and risk assessment of these unspeciated chemical sources. EPA Region 6 estimated levels of hazardous air pollutants in the facility-reported, unspeciated VOC emissions data sets utilizing SPECIATE[ii]. SPECIATE is the EPA's repository of organic compound emissions profile data for a wide variety of industrial sources.

For this project, the refinery and carbon black production subset of the SPECIATE library of 574 emission profiles was employed to estimate hazardous air pollutants in unspeciated VOC emissions. For a small number of VOC emission points where SPECIATE profiles were not available and material levels of unspeciated emissions existed, emission profiles were derived from material safety data sheets (MSDS), published technical information or the scientific literature. Clean Air Act (CAA) permit applications were also utilized as information sources for estimating speciated emissions data for these three facilities in the ODEQ air toxics project assessment area.

Modeling Scenario Development (October-December 2003): From the beginning of the study, it was understood that emission inventory data would be the basis for the modeling and risk assessment. The emission inventories are legally certified submittals by the facility. Although they are not ideal, they are consistent and submitted under a defined set of guidelines. However, due to the extent of the remaining unspeciated VOC emissions data and in anticipation of questions and concerns about the results of the study based on this data, the DEQ chose to evaluate the following two air dispersion modeling and risk assessment scenarios:

<u>**Scenario I-Company Submitted Data Only**</u>
In this scenario, only company-submitted data was used, except for some minor corrections and geo-corrections of coordinates, all of which were made in the emission inventory database as permanent changes.

Scenario II-Company Data Supplemented by Regulatory Agency Estimates
In this scenario, the company-submitted data was supplemented by regulatory agency estimates of the air toxics portion of the company-reported unspeciated VOC emissions. It is fairly common in studies of this kind to develop a "what if?" or "more conservative" scenario. DEQ's opinion is that the study methodology was already very conservative; nevertheless, DEQ opted to use the regulatory agency derived speciated emissions outlined above as a "more conservative" scenario.

MODELING RESULTS

The project yields results in terms of risk. Typically, increased lifetime cancer risk prediction results are evaluated by regulatory agencies in three ranges: 1 x 10^{-6} (one chance in a million) and lower is generally considered an acceptable and safe range; estimates in the range of 10^{-5} to 10^{-4} (one in a hundred thousand to one in ten thousand) require further study and evaluation; and confirmed risk estimates greater than 10^{-4} generally call for action. In this study, the model used a predicted adult exposure of 350 days a year for 30 years.

Scenario I-Company Submitted Data Only
No increased lifetime cancer risk greater than 10^{-5} (one in a hundred thousand) was predicted off facility property. Only a small band of locations directly north of the refinery fence line showed risk in the 10^{-5} to 10^{-6} range.

Scenario II-Company Data Supplemented by Regulatory Agency Estimates
Even this "more conservative" scenario showed similar results: no increased lifetime cancer risk greater than 10^{-5} (one in a hundred thousand) was predicted off facility property.
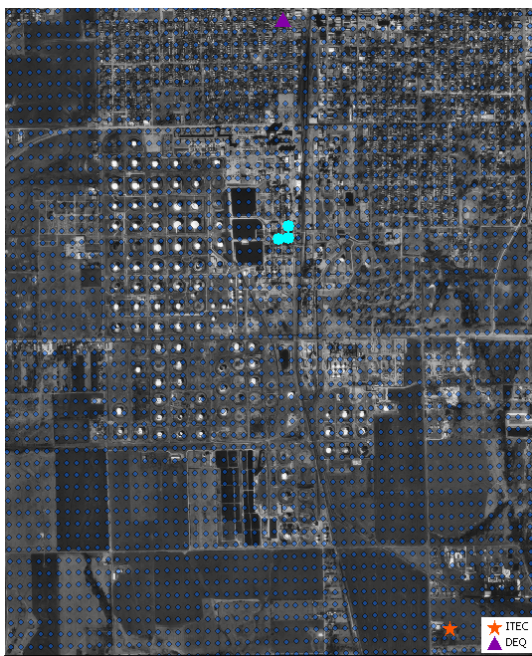
Scenario I modeling nodes with modeled risk greater than 10^{-5} (Ponca City monitoring sites shown for reference)
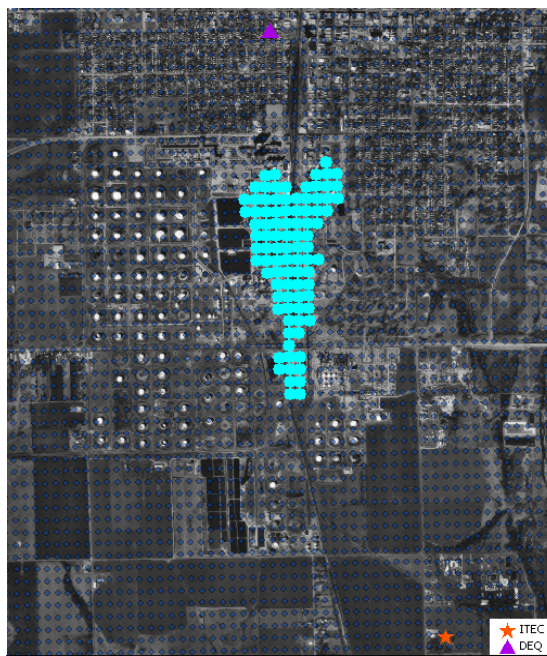
Scenario II modeling nodes with modeled risk greater than 10^{-5} (Ponca City monitoring sites shown for reference)

REPORT SUMMARY and CONCLUSIONS

Using the RAIMI process, the inhalation risk from VOC air toxics in the Ponca City assessment area was evaluated. Based on that process, which DEQ believes is sufficiently conservative and protective in nature, DEQ has concluded there is no significant increased lifetime cancer risk from VOC air toxics in the Ponca City area. Please note that this conclusion is valid only for the context of this study, which includes only VOC emissions as reported to the DEQ's Air Quality Division Emission Inventory.

Additional Local Air Toxics Data Collection/Evaluation

Air Toxics Monitoring: (November 2003-February 2004): To help address questions regarding the adequacy of air toxics emissions data or the accuracy of the modeling conducted using that data, an additional short-term air toxics monitoring project was conducted as a complement to the Ponca City assessment. Using equipment and analysis contracted from Environmental Research Group (ERG), AQD collected 30 canisters for Non-methane Organic Chemical analysis from November 11, 2003 to February 12, 2004 (every 3 days). The samples were collected every 3 days at an existing site in downtown Ponca City (314 West Cleveland)[iii]. This analysis provides data for 77 substances at below part per billion resolution. The monitoring project is not covered in this report because it was a separate project and the data will not be completely available until May 2004,. Monitoring data will be available on the DEQ web page by May 31, 2004.

Details about this study, the RAIMI process, emission modeling, risk assessment, and DEQ air monitoring activities in Ponca City are available from the DEQ and EPA Region 6 personnel listed on the CONTACTS page.

CONTACTS and Endnotes

For more information on the Ponca City Assessment please contact the following:

General Questions, questions about dates and schedules, and monitoring information:
>Randy Ward, DEQ
>AQD Staff Epidemiologist
>405-702-4164   email at **randy.ward@deq.state.ok.us**

Questions for Region 6, EPA's role in the study, etc.
>Ruben Casso
>Toxics Coordinator
>214-665-6763   email at **casso.ruben@epa.gov**

Questions on the modeling and the RAIMI process
>Steve Thompson
>Environmental Scientist
>214-665-2769   email at **thompson.steve@epa.gov**

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[i] For a complete explanation of the RAIMI process, contact Region 6 or see the RAIMI files available at http://www.epa.gov/Arkansas/6pd/rcra_c/raimi/raimi.htm

[ii] SPECIATE 3.2 is maintained by EPA's Emission Factors and Inventory Group (EFIG)). This latest version is a 32-bit PC program released in November, 2002 which can run under either Windows 95/98/ME or Windows NT/2000/XP and is available for no charge via Internet download or CD-ROM request at EPA's CHIEF (Clearinghouse for Inventories and Emission Factors) website: http://www.epa.gov/ttn/chief/software/speciate

[iii] For more information a copy of the approved Quality Assurance Project Plan (QAPP) for this project is available from DEQ. H:\QA\QAPPS\PC Toxics QAPP\Pctoxix_QAPPv2.doc on the DEQ internal network.